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PATENT

UNITED STATES PATENT APPLICATION

of

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for

FOLDING WORK TABLE

## BACKGROUND OF THE INVENTION

### Field of the Invention

[0001] This invention relates to a table the legs of which fold, especially a table upon which manual work, such as sawing, is performed.

### Description of the Related Art

[0002] United States patent no. 3,646,895, on line 69 of column 1 through line 3 of column 2, describes a Table with Folding Legs as follows:

[0003] "Table 10 when in use is supported by two sets of legs 17 and 21. With respect to one set 17 of legs, each leg consists of two pivotally joined portions 16 and 18 which are joined by a pin fastener assembly 22. When the table is folded, as shown in FIGS. 1 and 3, these upper leg portions 18 nest in a position parallel to and alongside the lower leg portions 16. When this leg set 17 is extended, as shown in FIGS. 2 and 4, the respective portions 16 and 18 are pivoted into alignment and prevented from pivoting further than 180° by abutting a stop bracket 24 which is fastened to the upper leg portion 18 by using two screws 26. In the other leg set 21, each leg 20 is in one piece.

[0004] "The respective leg sets 17 and 21 are pivotally joined together on each side of the table by using a pin fastener assembly 28, which is located so one set of legs 17 will extend lower than the other sets [sic] of legs 21 when the table 10 is folded, and when unfolded and in use, pin fastener assembly 28 holds the legs 16 and 20 together in their strong crossed, diagonal and triangular position."

[0005] The device of patent no. 3,646,895, however, has no device to assist in the unfolding of the legs for the table and also has no wheels or handle to facilitate transporting the table when the legs have been folded.

[0006] The Folding Table of United States patent no. 5,335,604 is very similar to that of patent no. 3,646,895 except that the free ends of the shorter segment of the jointed legs are connected to one another with a bar.

[0007] Thus, as with patent no. 3,646,895, the table of patent no. 5,335,604 has no device to assist in the unfolding of the legs for the table and also has no wheels or handle to facilitate transporting the table when the legs have been folded.

[0008] Although the Worktable of United States patent no. 5,067,535 has a spring 28 to aid the unfolding of the legs for the table and wheels 30 to make transporting the table when the legs have been folded easier, the spring functions over only a limited range; and the legs to which the wheels are attached extend straight beyond the legs, creating a potential physical conflict with the ground or other objects when the wheels are utilized to push or pull the table.

[0009] Lines 37 through 39 in column 4 of patent no. 5,067,535 clarify, "Once the legs are moved past the dead center position, springs 28 serve to open the table the rest of the way." And, on line 66 of column 3 through line 2 of column 4, the patent explains, "Front legs 17 and 19 are each equipped with one caster 30 on their rear sides facing rear legs 18 and 20. These casters are positioned upwards on legs 17 and 19 such that when the legs are unfolded, they are positioned above the floor on which the table is set."

[0010] Moreover, in the folding operation, legs of the table that are in contact with the surface upon which the table rests do not support some of the weight of the table until the table has been partially folded since lines 22 through 28 of column 4 in patent no. 5,067,535 declare, "When the table is in the partially folded-up position shown in FIG. 5, the user places the rear legs 18 and 20 on the floor, enabling the weight of the table, particularly when the saw or other tool is attached to tool mounting panel 3, to overcome the restoring force of springs 28, causing the table to be folded even further."

[0011] Springs are also utilized in the Folding Table for Use with a Table Saw of United States patent no. 6,182,935. Such springs, though, merely serve, according to lines 3 through 5 in column 6, ". . . to bias the actuator plate in the locked and lower position . . ." (Lines 36 through 37 of column 5 explain that the ". . . actuator plate 60 is . . . used to secure the leg mechanism 25 in the open and closed position . . .") and, as stated in lines 10 through 12 of column 6, ". . . to bias the legs into an open position when the actuator plate is in the released position . . ."

[0012] Significantly, however, a spring, unlike a piston within a cylinder, does not tend smoothly to resist reverse motion and has more tendency to break loose suddenly.

[0013] United States patent no. 6,240,987 applies to a Tool Supporting Device which has a folding main table and two folding auxiliary tables attached to one another as well as wheels for transporting the folded device.

[0014] The process for folding and unfolding involves significant manipulation, which would render having a tool attached to either the main table or one of the auxiliary tables during the folding process difficult. Furthermore, folding requires that the main table 12 be lifted in order to remove the hooks 42 from the mounting rod 36; and, as can be determined from FIG. 1 and FIG. 4, the top of the main table is on the bottom after folding. These facts would provide an additional impediment to having a tool attached to the main table during the folding process. And a final impediment is created by the fact that the auxiliary tables 54 are adjacent to the main table 12 with at least one auxiliary table 54 being upside down after folding.

[0015] Although the Collapsible Portable Saw Stand of United States patent no. 6,578,856 can physically support a saw during the folding and unfolding process and possesses wheels to facilitate transportation of the folded stand and saw, it appears that considerable force would have to be used to unfold the stand when the saw is in place.

[0016] A user would have to hold a bar 26 to maintain two legs 20 on an angle while the user pulls a cord attached to a handle 38 in order to slide one end of a platform 18 holding the saw 12 up the two legs 20.

#### BRIEF SUMMARY OF THE INVENTION

The present Folding Work Table is an improvement for the Table with Folding Legs of United States patent no. 3,646,895.

[0017] A first facet of the improvement is a power assist actuator (which comprises a housing having a closed first end, a bore with a piston slidably mounted within the bore, and a second end containing an aperture; pressurized fluid—preferably a gas—on a first side of the piston; and a rod having a first end connected to a second side of the piston, an intermediate portion passing through the aperture in the second end of the housing, and a second end) having a first end (which is also the first end of the housing) pivotally connected to the tabletop and a second end (which is also the second end of the rod) pivotally connected to a first one-piece leg. Preferably, a second power assist actuator also has a first end pivotally connected to the tabletop

and a second end pivotally connected to a second one-piece leg. (The orientation of either or both power assist actuators can be reversed, *i.e.*, the first end of a power assist actuator can be pivotally connected to a one-piece leg while the second end is pivotally connected to the tabletop.)

[0018] In unfolding the table, the vast majority of the weight of the tabletop and any item attached to the tabletop is borne by the one-piece legs while the power assist actuators push the tabletop away from the free end of each one-piece leg, *i.e.*, the end that is not attached to the tabletop. This allows the two two-piece legs (which have two pivotally attached segments) to unfold (a process which involves the rotational movement away from the tabletop of a second end of the segment which has a first end pivotally attached to the tabletop and also includes the second segment rotating from an initial position where such second segment is substantially parallel to the first segment and passes substantially adjacent to the first end of the first segment to a position substantially one hundred and eighty degrees from such first position) and, consequently, enables the free ends of the two-piece legs to be placed on a support surface, such as a floor, thereby rotating the tabletop to a horizontal position.

[0019] During the folding of the table, the power assist actuators aid in preventing the tabletop and any attached tool from too rapidly rotating toward the free ends of the two-piece legs.

[0020] A second facet of the improvement involves the attachment of a wheel near the free end of each two-piece leg; bending the free end of each two-piece leg away from the tabletop; and having the angle of the bend, the dimensions of the two-piece legs, and the dimensions and point of attachment for each wheel such that the free ends of the two-piece legs will hold the wheels above the support surface when the two-piece legs have been unfolded to support the tabletop while having such free ends higher than the bottom of the wheels and providing ground clearance for the free end that is substantially equal to the radius of the wheel near that free end when the table has been folded.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0021] FIG. 1 is a perspective view of the first embodiment of the unfolded Folding Work Table.

- [0022] FIG. 2 is a lateral view of the first embodiment of the unfolded Folding Work Table.
- [0023] FIG. 3 is an end view of the first embodiment of the unfolded Folding Work Table.
- [0024] FIG. 4 illustrates, in a cutaway view, a power assist actuator.
- [0025] FIG. 5 depicts a pin utilized to maintain either or both two-piece legs in an unfolded position.
- [0026] FIG. 6 depicts a pin utilized to maintain either or both two-piece legs in a folded position.
- [0027] FIG. 7 is a perspective view of the second, wheeled, embodiment of the unfolded Folding Work Table.
- [0028] FIG. 8 is a lateral view of the second, wheeled, embodiment of the Folding Work Table in a partially folded state with a tool attached to the tabletop.
- [0029] FIG. 9 is a lateral view of the second, wheeled, embodiment of the Folding Work Table in a completely folded state with a tool attached to the tabletop.

#### DETAILED DESCRIPTION OF THE INVENTION

- [0030] A first embodiment of the Folding Work Table includes, as illustrated in FIG. 1, FIG. 2, and FIG. 3, two one-piece legs 1, 2. A first end 3 of the first one-piece leg 1 is pivotally attached to a tabletop 4 having a first end 5, a second end 6, a first side 7, and a second side 8. Similarly, a first end 9 of the second one-piece leg 2 is pivotally attached to the tabletop 4 but at a point of attachment 10 which is closer to the second side 8 of the tabletop 4 than is the point of attachment 11 for the first end 3 of the first one-piece leg 1.
- [0031] Two two-piece legs 12, 13 also are included. A first end 14 of a first segment 15 of the first two-piece leg 12 is pivotally attached to the tabletop 4. A second end 16 of the first segment 15 of the first two-piece leg 12 is pivotally attached to a first end 17 of a second segment 18 of the first two-piece leg 12. Likewise, a first end 19 of a first segment 20 of the second two-piece leg 13 is pivotally connected to the tabletop 4 but at a point of attachment 21 which is closer to the second side 8 of the tabletop 4 than is the point of attachment 22 for the first end 14 of the first segment 15 of the first two-piece leg 12. A second end 23 of the first segment 20 of the second two-piece leg 13 is pivotally attached to a first end 24 of a second segment 25 of the second two-piece leg 13.

[0032] Also, the point of attachment 11 for the first end 3 of the first one-piece leg 1 is closer to the first end 5 of the tabletop 4 than is the point of attachment 22 for the first end 14 of the first segment 15 of the first two-piece leg 12; and the point of attachment 10 for the first end 9 of the second one-piece leg 2 is closer to the first end 5 of the tabletop 4 than is the point of attachment 21 for the first end 19 of the first segment 20 of the second two-piece leg 13.

[0033] Furthermore, the first one-piece leg 1 is pivotally attached to the second segment 18 of the first two-piece leg 12 at a point 26 intermediate between the first end 17 and the second or free end 27 of the second segment 18; and the second one-piece leg 2 is pivotally attached to the second segment 25 of the second two-piece leg 13 at a point 28 intermediate between the first end 24 and the second or free end 29 of the second segment 25.

[0034] The point of attachment 11 for the first end 3 of the first one-piece leg 1 is preferably near the first side 7 of the tabletop 4, and the point of attachment 10 for the first end 9 of the second one-piece leg 2 is preferably near a second side 8 of the tabletop 4.

[0035] As indicated above, when either two-piece leg 12, 13 is folded, the first segments 15, 20 are substantially adjacent to the bottom 30 of the tabletop 4 with such first segments 15, 20 substantially parallel to their respective second segments 18, 25 and having such second segments 18, 25 passing substantially adjacent to the first ends 14, 19 of their respective first segments 15, 20. As the two-piece legs 12, 13 unfold, the second ends 16, 23 of the respective first segments 15, 20 rotationally move away from the bottom 30 of the tabletop 4; and the second segments 18, 25 rotate approximately one hundred eighty degrees in reference to their respective first segments 15, 20.

[0036] Either the second end 16, 23 of the first segment 15, 20 or the first end 17, 24 of the second segment 18, 25 or both may extend beyond the point of pivotal connection 31, 32 of the second end 16, 23 of the first segment 15, 20 and the first end 17, 24 of the second segment 18, 25. Preferably, attached either to the top 33, 34 of the first segment 15, 20 of at least one, and preferably both, of the two-piece legs 12, 13 on the portion 35, 36, if any, of such first segment 15, 20 that extends away from the first end 14, 19 of the first segment 15, 20 beyond the point of pivotal connection 31, 32 of the second end 16, 23 of the first segment 15, 20 and the first end 17, 24 of the second segment 18, 25 or to the top 37, 38 of the second segment 18, 25 of at least one, and preferably both, of the two-piece legs 12, 13 on the portion 301, 302, if any, of such

second segment 18, 25 that, when the two-piece leg 12, 13 has been unfolded, extends away from the second end 27, 29 of the second segment 18, 25 beyond the point of pivotal connection 31, 32 of the second end 16, 23 of the first segment 15, 20 and the first end 17, 24 of the second segment 18, 25 is a stop 39, 40. If the stop 39, 40 is attached to the top 33, 34 of the first segment 15, 20, such stop 39, 40 extends over the second segment 18, 25 so that such second segment 18, 25 cannot rotate more than approximately one hundred eighty degrees from the folded position of such second segment 18, 25. Similarly, if the stop 39, 40 is attached to the top 37, 38 of the second segment 18, 25, such stop 39, 40 extends over the first segment 15, 20 so that such second segment 18, 25 cannot rotate more than approximately one hundred eighty degrees from the folded position of such second segment 18, 25. (Alternatively, if the stop 39, 40 is attached to the second end 16, 23 of the first segment 15, 20 or the first end 17, 24 of the second segment 18, 25 on the opposite side of the point of pivotal connection 31, 32, such stop 39, 40 must be attached to the bottom 201, 202 of the first segment 15, 20 of at least one, and preferably both, of the two-piece legs 12, 13 or to the bottom 203, 204 of the second segment 18, 25 of at least one, and preferably both, of the two-piece legs 12, 13, in order to accomplish its function of limiting the rotation of the second segment 18, 25 of at least one, and preferably both, of the two-piece legs 12, 25 with respect to the first segment 15, 20 of such two-piece leg or legs 12, 25.)

[0037] As discussed above, a first major improvement provided by the present invention to folding tables of this type is the employment of a power assist actuator 41.

[0038] And, as seen in FIG. 4 and explained above, the power assist actuator 41 comprises a housing 42 having a closed first end 43, a bore 44 with a piston 45 slidably mounted within the bore 44, and a second end 46 containing an aperture 47; pressurized fluid 48—preferably a gas—on a first side 49 of the piston 45; and a rod 51 having a first end 52 connected to a second side 53 of the piston 45, an intermediate portion 54 passing through the aperture 47 in the second end 46 of the housing 42, and a second end 55.

[0039] The power assist actuator 41 has, as indicated above, a first end 56 (which is also the first end 43 of the housing 42) pivotally connected to the tabletop 4 and a second end 57 (which is also the second end 55 of the rod 51) pivotally connected to a first one-piece leg 1. Preferably, a second power assist actuator 58 also has a first end 59 pivotally connected to the tabletop 4 and



a second end 60 pivotally connected to a second one-piece leg 2. (The orientation of either or both power assist actuators 41, 58 can, however, be reversed, *i.e.*, the first end 56, 59 of a power assist actuator 41, 58 can be pivotally connected to a one-piece leg 1, 2 while the second end 57, 60 is pivotally connected to the tabletop 4.)

[0040] Then, as explained above, the power assist actuators 41, 58 facilitate the folding and unfolding of the table 100.

[0041] Several further subsidiary options also exist.

[0042] In a first such option, a screw 61 is threadably mounted in the bottom 62 of one of the one-piece legs 1, 2 in order to further stabilize the table 100 when it is placed upon a somewhat uneven surface.

[0043] Also, one or more apertures 63 preferably exist in the first segment 15, 20 of one or both two-piece legs 12, 13; and one or more corresponding apertures 64 exist in the second segments 18, 25 of such two-piece leg or legs 12, 13 with such aperture 63 and corresponding apertures 64 being so located that, when the two-piece leg 12, 13 is unfolded, at least one aperture 63 and one corresponding aperture 64 of such leg 12, 13 are so aligned that a pin 65 can, as illustrated in FIG. 5, be inserted in such aligned aperture 63 and corresponding aperture 64 to facilitate maintaining the two-piece leg 12, 13 in the unfolded position and, when the two-piece leg 12, 13 is folded, at least one aperture 63 and one corresponding aperture 64 of such leg 12, 13 are so aligned that a pin 65 can, as shown in FIG. 6, be inserted in such aligned aperture 63 and corresponding aperture 64 to facilitate maintaining the two-piece leg 12, 13 in the folded position.

[0044] Additionally, either the first one-piece leg 1 or the first two-piece leg 12 can be closer to the first side 7 of the tabletop 4; and either the second one-piece leg 2 or the second two-piece leg 13 can be closer to the second side 8 of the tabletop 4.

[0045] And, in order further to add stability to the table 100, a crosspiece 66 is optionally attached between the similar enumerated components in any or all of the following sets: the first segments 15, 20 of the two-piece legs 12, 13; the second segments 18, 25 of the two-piece legs 12, 13 below the points of pivotal attachment 26, 28; and the one-piece legs 1, 2 below the points of pivotal attachment 26, 28. (Of course, locating a crosspiece 66 in some areas may preclude either the one-piece legs 1, 2 or the two-piece legs 12, 13 from being completely parallel to one

another or from touching the bottom 30 of the tabletop 4 along their entire length when in the folded position; this would, though, simply be one factor for consideration and not necessarily a deterrent to the use of a crosspiece 66.

[0046] The second major improvement provided by the present invention to folding tables of this type is, as portrayed in FIG. 7, FIG. 8, and FIG. 9, the utilization of a first wheel 67 rotatably connected to the second segment 18 of the first two-piece leg 12 near the free end 27 of the second segment 18 of the first two-piece leg 12 and a second wheel 68 rotatably connected to the second segment 25 of the first two-piece leg 12 near the free end 29 of the second segment 25 of the second two-piece leg 13. Near the point of attachment 69 of the first wheel 67 to the second segment 18 of the first two-piece leg 12, the second segment 18 of the first two-piece leg 12 is bent away from the tabletop 4, making a first angle  $\alpha$  with respect to such second segment 18. Similarly, near the point of attachment 70 of the second wheel 68 to the second segment 25 of the second two-piece leg 13, the second segment 25 of the second two-piece leg 13 is bent away from the tabletop 4, making a second angle  $\beta$  with respect to such second segment 25. Preferably, the first angle  $\alpha$  and the second angle  $\beta$  are substantially equal to one another.

[0047] The angles  $\alpha$  and  $\beta$  of such bends; the dimensions of the first and second two-piece leg 12, 13; and the points of attachment 69, 70 of the first and second wheel 67, 68 as well as the dimensions of such wheels 67, 68 are, as discussed above, selected such that the free ends 27, 29 of the second segments 18, 25 of the two-piece legs 12, 13 will, as depicted in FIG. 7, hold the wheels 67, 68 above a surface supporting the table 100 when the two-piece legs 12, 13 have been unfolded to support the tabletop 4 while, as shown in FIG. 9, having such free ends 27, 29 higher than the bottoms 71, 72 of the wheels 67, 68 and providing ground clearance for each free end 27, 29 that is preferably substantially equal to the radius 73, 74 of the wheel 67, 68 near such free end 27, 29 when the table 100 has been folded. (For purposes of illustration, a tool 75 is shown attached to the tabletop 4 in FIG. 8 and FIG. 9.)

[0048] When there are no wheels 67, 68, the free ends 27, 29 of the second segments 18, 25 of the two-piece legs 12, 13 as well as the free or second ends 76, 77 of the first and second one-piece legs 1, 2 are preferably bent outward in order to add additional stability to the table 100. When there are wheels 67, 68, the free ends 76, 77 of the first and second one-piece legs 1, 2 are bent outward sufficiently to avoid the wheels 67, 68.

[0049] Furthermore, when a one-piece leg 1, 2 is inside the two-piece legs 12, 13, either there can be no axle 78 extending between the wheels 67, 68 or such one-piece leg must be shaped to avoid an axle 78 extending between the wheels 67, 68 when the table 100 has been folded.

[0050] Especially when wheels 67, 68 are employed, it is preferable to have a handle 79 attached to the tabletop 4 near a first end 5 of such tabletop 4. And, using any technique that is well known in the art, the handle 79 can preferably be extended from such first end 5 and locked into place. One example of such a well-known technique is having a tube 80 attached to the bottom 30 of the tabletop 4 with the handle 79 slidably mounted with the tube 80 in such a manner that a first end 81 of the handle 79 extends from a first end 82 of the tube 80 past the first end 5 of the tabletop 4 while a second end 83 of the handle 79 extends from a second end 84 of the tube 80 in substantially the opposite direction, viz., under the tabletop 4; a stop 85 attached to the second end 83 of the handle 79 precludes the second end 83 of the handle 79 from entering the tube 80 so that the handle 79 cannot slide from the tube 80; and a thumb screw 86 is mounted within a threaded aperture 87 of the tube 80 for locking the handle 79 in position when such handle projects a desired distance from the tube 80.

[0051] As used herein, the terms “substantially” and “approximately” indicate that one skilled in the art would consider the value modified by such terms to be within acceptable limits for the stated value. Also as used herein the term “preferable” or “preferably” means that a specified element or technique is more acceptable than another but not that such specified element or technique is a necessity.